What is Claimed is:

1. A rolling element

which is made from a steel material which contains at least 0.5 to 1.5 wt% carbon and 0.2 to 2.0 wt% one or more alloy elements selected from V, Ti, Zr, Nb, Ta and Hf; and in which 0.4 to 4.0 % by volume one or more compounds selected from the carbides, nitrides and carbonitrides of said alloy elements and having an average particle diameter of 0.2 to 5 μm are dispersed,

wherein the soluble carbon concentration of a martensite parent phase of a rolling contact surface layer is adjusted to 0.3 to 0.8 wt%, the martensite parent phase having been subjected to induction hardening and low temperature tempering, and

wherein one or more of said carbides, nitrides and carbonitrides are dispersed in an amount of 0.4 to 4.0% by volume within the martensite parent phase.

2. The rolling element according to claim 1, wherein 2 to 15% by volume cementite particles containing 2.5 to 10wt% Cr as an average composition disperse in the martensite parent phase of the rolling contact surface layer.

3. The rolling element according to claim 2, wherein prior austenite grains in a quench hardened layer are fined to have a particle size equal to or greater than the level of ASTM No. 10 and wherein the amount of retained austenite is adjusted to 10 to 50% by volume.

4. The rolling element according to claim 1, wherein said steel material contains 0.5 to 3.0 wt% Si, 0.20 to 1.5 wt% Al or 0.5 to 3.0 wt% (Si + Al), and further contains one or more elements selected from

Mn, Ni, Cr, Mo, Cu, W, B, and Ca, unavoidable impurity elements such as P, S, N and O, and balance substantially consisting of Fe.

5. The rolling element according to claim 4, wherein 0.3 to 1.5 wt% Ni is added to said steel material containing 0.2 wt% or more Al.

6. The rolling element according to claim 5, wherein cementite and retained austenite disperse in a quench hardened layer of the steel material.

7. The rolling element according to claim 4, wherein said steel material at least contains 0.3 to 1.5 wt% Cr and further contains one or more alloy elements selected from 0.2 to 1.5 wt% Mn; 0.5 wt% or less Mo; and 0.5 wt% W or less.

8. The rolling element according to claim 7, wherein cementite and retained austenite disperse in a quench hardened layer of the steel material.

9. The rolling element according to any one of claims 1 to 8, wherein the rolling contact surface layer is quench hardened by induction hardening in which rapid cooling is carried out after rapid induction heating is done within 10 seconds
in the temperature region of the A1 temperature of the steel material to a quenching temperature of 900 to 1050℃.

10. The rolling element according to claim 9, wherein the quench hardened layer is formed along the contour of teeth by quenching subsequent to the induction heating.

11. The rolling element according to claim 9, which is a gear used under a slipping condition and wherein a compressive residual stress of at least 50 kgf/mm^2 or more remains at the roots of the teeth.

12. The rolling element according to claim 11, wherein the compressive residual stress is generated by mechanical means such as shot peening.

13. A rolling element,

which is made from a steel material which at least contains 0.2 to 2.0 wt% one or more alloy elements selected from V, Ti, Zr, Nb, Ta and Hf and in which 0.4 to 4.0 % by volume one or more compounds selected from the carbides, nitrides and carbonitrides of said alloy elements and having an average particle diameter of 0.2 to 5 μm are dispersed;

wherein one or more compounds selected from the nitrides and/or carbonitrides of V, Ti, Zr, Nb, Ta and Hf and having an average particle diameter of 0.2μm or less are additionally precipitately dispersed in the rolling contact surface layer by carburizing, carbonitriding or nitriding; and

wherein the carbon content of the rolling contact surface layer is adjusted to 0.65 to 1.5 wt% and/or the nitrogen content of the rolling contact surface layer is adjusted to 0.1 to 0.7 wt%.

14. The rolling element according to claim 13 produced by quenching and tempering a steel material after carburizing, carbonitriding or nitriding, the steel material at least containing 0.2 to 0.8 wt% C, and further containing 0.5 to 3.0 wt% Si, 0.2 to 1.5 wt% Al or 0.5 to 3.0 wt% (Si + Al), and further containing one or more alloy elements selected from Mn, Ni, Cr, Mo, V, Cu, W, Ti, Nb, B, Zr, Ta, Hf and Ca, unavoidable impurity elements such as P, S, N and O, and balance substantially consisting of Fe.

15. The rolling element according to claim 14, wherein 0.3 to 1.5 wt% Ni is added to said steel material containing 0.2 wt% or more Al.

16. The rolling element according to claim 13, wherein the rolling contact surface layer is induction hardened so as to have a martensitic structure and contain fined prior austenite grains.

17. The rolling element according to claim 14, wherein the steel material contains 1.0 to 2.5 wt% (Mn + Ni), 0.5 to 1.5 wt% Cr, and 0.35 wt% or less Mo or alternatively contains 0.0005 to 0.005 wt% B in addition to 1.0 to 2.5 wt% (Mn + Ni), 0.5 to 1.5 wt% Cr and 0.35 wt% or less Mo.

18. The rolling element according to claim 13, which is a gear used under a slipping condition and wherein a compressive residual stress of at least 50 kgf/mm^2 or more remains at the roots of teeth.

19. The rolling element according to any one of claims 13 to 18, wherein the compressive residual stress is generated by mechanical means such as shot peening.

20. A method of producing a rolling element from a steel material which contains at least 0.5 to 1.5 wt% carbon; 0.3 to 1.5 wt% Cr; and 0.2 to 2.0 wt% one or more alloy elements selected from V, Ti, Zr, Nb, Ta and Hf; and in which 0.4 to 4.0 % by volume one or more compounds selected from the carbides, nitrides and carbonitrides of said alloy elements and having an average particle diameter of 0.2 to 5 μm and 7.5 to 20 % by volume cementite are dispersed,

wherein the soluble carbon concentration of a martensite parent phase of a rolling contact surface layer, which has been subjected to induction heating quenching and low temperature tempering, is adjusted to 0.3 to 0.8 wt% and

wherein 0.4 to 4.0% by volume one or more of said carbides, nitrides and carbonitrides and 2 to 15% by volume cementite are dispersed within the martensite parent phase.

21. The method of producing a rolling element according to claim 20, wherein by use of a steel material in which the Cr concentration of the cementite has been adjusted to 2.5 to 10 wt% and which has been subjected to a thermal treatment for spheroidizing the cementite, the soluble carbon concentration of the martensite parent phase is adjusted to 0.35 to 0.8 wt%, 2 to 15 % by volume granular cementite having an average particle diameter of 1.5 μm or less is dispersed in the parent phase, and 10 to 50% by volume retained austenite is formed.

22. The method of producing a rolling element according to claim 21, wherein said induction heating/quenching of the rolling contact surface layer of the invention is performed such that rapid cooling is carried out subsequently to rapid heating in which the temperature of the steel material is raised from its A1 temperature to a quenching temperature of 900 to 1050℃ within 10 seconds.

23. The method of producing a rolling element according to claim 22, wherein said induction heating/quenching is performed such that an induction-hardened-contour gear having a quench hardened layer formed along the contour of teeth is produced with the speed of heating at least from the A1 temperature to said quenching temperature set to 150℃/sec or more.

24. A method of producing a rolling element from a steel material which contains at least 0.2 to 0.8 wt% carbon; 0.5 to 1.5 wt% Cr; and 0.2 to 2.0 wt% one or more alloy elements selected from V, Ti, Zr, Nb, Ta and Hf; and in which 0.4 to 4.0% by volume one or more compounds selected from the carbides, nitrides and carbonitrides of said alloy elements and having an average particle diameter of 0.2 to 5 μm and 7.5 to 20% by volume cementite are dispersed,

wherein a carburizing, carbonitriding or nitriding treatment is applied to a rolling contact surface layer of said steel material so that one or more compounds selected from the nitrides and carbonitrides of V, Ti, Zr, Nb, Ta and Hf and having an average particle diameter of 0.2 μm or less are additionally precipitately dispersed and so that the carbon content of the rolling contact surface is adjusted to 0.65 to 1.5 wt% and/or the nitrogen content of the rolling contact surface is adjusted to 0.1 to 0.7 wt%, while 7.5 to 20% by volume cementite being dispersed, and

wherein induction heating/quenching and low-temperature tempering are further applied to the rolling contact surface layer so that the soluble carbon concentration of a martensite parent phase of the rolling contact surface layer is adjusted to 0.35 to 0.8 wt%, and 0.4 to 4.0% by volume one or more of said carbides, nitrides and carbonitrides and 2 to 15% by volume cementite are dispersed in the parent phase.

25. The method of producing a rolling element according to any one of claims 20 to 24, wherein the compressive residual stress of the rolling contact surface layer is increased by mechanical means such as

shot peening.